UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,194	06/25/2003	Paul Childs	GMC 0040 PA/40320.43	4364

7590 11/02/2004

Killworth, Gottman, Hagan & Schaeff, L.L.P.
Suite 500
One Dayton Centre
Dayton, OH 45402-2023

EXAMINER	
TRAN, BINH Q	

ART UNIT	PAPER NUMBER
3748	

DATE MAILED: 11/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/606,194	CHILDS ET AL.
	Examiner	Art Unit
	BINH Q. TRAN	3748

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-38 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-38 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 10/30/2004.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> **(e) the invention was described in-**
> **(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or**
> **(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).**

Claims 1, 5-16, 19-25, 28, and 30-38 are rejected under 35 U.S.C. 102 (b) as being anticipated by Andrews et al. (Andrews) (Patent Number 6,464,854).

Regarding claims 1, 25, and 32, Andrews discloses device for generating hydrogen from a water vapor containing exhaust (10), said device comprising an exhaust diverter (e.g. 307, 328) and a hydrogen generation section (e.g. 20, 24), wherein: said exhaust diverter is configured to divert a portion of said exhaust and deliver said diverted exhaust to said hydrogen generation section; said hydrogen generation section comprises an electrolysis unit defining a hermetically sealed void volume configured to accumulate and store hydrogen generated by said electrolysis unit (e.g. See col. 8, lines 27-67; col. 9, lines 1-19); wherein the exhaust diverter is in communication with a heat exchanger (e.g. 304, 320, 325) configured to increase fractional

relative humidity of a portion of said diverted exhaust by cooling said diverted exhaust; and said hydrogen generation section is configured to deliver said hydrogen at a hydrogen output of said electrolysis unit (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 5, Andrews further discloses that the hydrogen generation further comprises a pressure monitor configured to monitor said accumulation and storage of hydrogen within said void volume (e.g. See col. 10, lines 4-26).

Regarding claim 6, Andrews further discloses that the hydrogen generation section comprises at least one hydrogen injector configured to control release of hydrogen stored within said void volume (e.g. See col. 10, lines 4-26).

Regarding claim 7, Andrews further discloses a controller (e.g. 315) configured to monitor accumulation and storage of hydrogen in said void volume (e.g. See col. 10, lines 4-26).

Regarding claim 8, Andrews further discloses that the step of monitoring of said accumulation and storage of hydrogen is enabled through a pressure monitor in communication with said controller (e.g. See col. 10, lines 4-26).

Regarding claim 9, Andrews further discloses that the pressure monitor is configured to monitor pressure of said hermetically sealed void volume (e.g. See col. 10, lines 4-26).

Regarding claim 10, Andrews further discloses that the electrolysis unit (24) comprises an external box type manifold on an exhaust input side of said electrolysis unit (e.g. See col. 10, lines 4-26).

Regarding claim 11, Andrews further discloses that the a width dimension of said electrolysis unit, defined along said external box type manifold is at least twice as large as a

length dimension of said electrolysis unit, defined between said exhaust input side and an exhaust output side of said electrolysis unit (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 12, Andrews further discloses that the wherein flow field grooves defined by said electrolysis unit extend at least as far as said external box type manifold (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 13, Andrews further discloses that the external box type manifold is tapered from a maximum cross sectional area at an input side of said manifold to a minimum cross sectional area at an output side of said manifold (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 14, Andrews further discloses that the electrolysis unit is thermally coupled to an exhaust duct carrying said exhaust (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 15, Andrews further discloses that the hydrogen generation section is configured lo return an oxygen-enriched exhaust to a non-diverted portion of said exhaust (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 16, Andrews further discloses that the electrolysis unit is configured to generate a substantial amount of hydrogen from a diverted exhaust characterized by a fractional relative humidity of about 1 to about 3 percent (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 19, Andrews further discloses that the hydrogen generation section is configured to deliver substantially pure hydrogen at said hydrogen output of said electrolysis unit (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 20, Andrews further discloses that the device comprises an engine configured to generate torque; and said engine generates said exhaust (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 21, Andrews further discloses that the engine comprises a diesel engine (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 22, Andrews further discloses that the engine is configured such that said exhaust is characterized by an oxygen content of about 1 to about 20 percent, by weight (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 23, Andrews further discloses a vehicle body; and an engine configured to generate said exhaust and sufficient torque to accelerate said vehicle body (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 24, Andrews further discloses that a controller configured to deactivate said exhaust diverter where said vehicle body decelerates (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 28, Andrews further discloses that the heat exchanger comprises an air-to-air heat exchanger (e.g. See Figs. 1, 8, and 11-12; col. 8, lines 27-67; col. 9, lines 1-67; col. 10, lines 1-12).

Regarding claim 30, Andrews further discloses a semi-permeable membrane configured to extract or concentrate water in said diverted exhaust (e.g. See Fig. 2; col. 9, lines 1-67; col. 10, lines 1-24).

Regarding claim 31, Andrews further discloses a condensation unit configured to extract or concentrate water in said diverted exhaust (e.g. See Fig. 2; col. 9, lines 1-67; col. 10, lines 1-24).

Regarding claim 33, Andrews further discloses that peripheral system comprises a fuel injection system of said engine (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 34, Andrews further discloses that peripheral system comprises an engine cooling system (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claims 35, Andrews further discloses that peripheral system comprises a suspension system (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 36, Andrews further discloses that peripheral system comprises a gaseous filter regeneration system (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 37, Andrews further discloses that peripheral system comprises a hydrogen storage system (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Regarding claim 38, Andrews further discloses that hydrogen storage system comprises hydrogen dispensing hardware (e.g. See Figs. 1, 8, and 11-12; col. 13, lines 3-67; col. 14, lines 1-67).

Claims 1-25, and 30-38 are rejected under 35 U.S.C. 102 (b) as being anticipated by Zagaja et al. (Zagaja) (Patent Number 6,659,049).

Regarding claims 1, 25, and 32, Zagaja discloses device for generating hydrogen from a water vapor containing exhaust, said device comprising an exhaust diverter (e.g. 15) and a hydrogen generation section (e.g. 18, 22, 32, 36), wherein: said exhaust diverter is configured to divert a portion of said exhaust and deliver said diverted exhaust to said hydrogen generation section; said hydrogen generation section comprises an electrolysis unit defining a hermetically sealed void volume configured to accumulate and store hydrogen generated by said electrolysis unit (e.g. 32, 36); wherein the exhaust diverter is in communication with a heat exchanger (e.g. 18) configured to increase fractional relative humidity of a portion of said diverted exhaust by cooling said diverted exhaust (e.g. See col. 5, lines 14-39); and said hydrogen generation section is configured to deliver said hydrogen at a hydrogen output of said electrolysis unit (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 5, Zagaja further discloses that the hydrogen generation further comprises a pressure monitor configured to monitor said accumulation and storage of hydrogen within said void volume (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 6, Zagaja further discloses that the hydrogen generation section comprises at least one hydrogen injector configured to control release of hydrogen stored within said void volume (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 7, Zagaja further discloses a controller (e.g. 40) configured to monitor accumulation and storage of hydrogen in said void volume (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 8, Zagaja further discloses that the step of monitoring of said accumulation and storage of hydrogen is enabled through a pressure monitor in communication with said controller (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 9, Zagaja further discloses that the pressure monitor is configured to monitor pressure of said hermetically sealed void volume (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 10, Zagaja further discloses that the electrolysis unit (36) comprises an external box type manifold on an exhaust input side of said electrolysis unit (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 11, Zagaja further discloses that the a width dimension of said electrolysis unit, defined along said external box type manifold is at least twice as large as a length dimension of said electrolysis unit, defined between said exhaust input side and an exhaust output side of said electrolysis unit (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 12, Zagaja further discloses that the wherein flow field grooves defined by said electrolysis unit extend at least as far as said external box type manifold (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 13, Zagaja further discloses that the external box type manifold is tapered from a maximum cross sectional area at an input side of said manifold to a minimum cross sectional area at an output side of said manifold (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 14, Zagaja further discloses that the electrolysis unit is thermally coupled to an exhaust duct carrying said exhaust (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 15, Zagaja further discloses that the hydrogen generation section is configured lo return an oxygen-enriched exhaust to a non-diverted portion of said exhaust (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claims 16-18, Zagaja further discloses that the electrolysis unit is configured to generate a substantial amount of hydrogen from a diverted exhaust characterized by a fractional relative humidity of about 1 to about 3 percent at about 92 ^{0}C to 125 ^{0}C (e.g. See Figs. 1-2; col. 4, lines 6-67; col. 5, lines 1-53).

Regarding claim 19, Zagaja further discloses that the hydrogen generation section is configured to deliver substantially pure hydrogen at said hydrogen output of said electrolysis unit (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 20, Zagaja further discloses that the device comprises an engine configured to generate torque; and said engine generates said exhaust (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 21, Zagaja further discloses that the engine comprises a diesel engine (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 22, Zagaja further discloses that the engine is configured such that said exhaust is characterized by an oxygen content of about 1 to about 20 percent, by weight (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 23, Zagaja further discloses a vehicle body; and an engine configured to generate said exhaust and sufficient torque to accelerate said vehicle body (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 24, Zagaja further discloses a controller configured to deactivate said exhaust diverter where said vehicle body decelerates (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 30 Zagaja further discloses that a semi-permeable membrane configured to extract or concentrate water in said diverted exhaust (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 31 Zagaja further discloses that a condensation unit configured to extract or concentrate water in said diverted exhaust (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 33, Zagaja further discloses that peripheral system comprises a fuel injection system of said engine (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 34, Zagaja further discloses that peripheral system comprises an engine cooling system (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claims 35, Zagaja further discloses that peripheral system comprises a suspension system (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 36, Zagaja further discloses that peripheral system comprises a gaseous filter regeneration system (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 37, Zagaja further discloses that peripheral system comprises a hydrogen storage system (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Regarding claim 38, Zagaja further discloses that hydrogen storage system comprises hydrogen-dispensing hardware (e.g. See Figs. 1-2; col. 3, lines 15-67; col. 4, lines 1-53).

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 2-4, 17-18, 26-27, and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Andrews in view of design choice.

Regarding claims 2-4, 17-18, 26-27, and 29, Andrews discloses all the claimed limitation as discussed above except that the volumetric capacity of between about 0.01 mL and about 10 mL per square centimeter of electrolysis unit cell area at pressures of between about 5 psi (35 kPa) and about 1500 psi (10,500 kPa); and the fractional relative humidity to at least about 70%.

Regarding the specific range of the volumetric capacity of electrolysis unit cell area, and the pressures of electrolysis unit cell area, it is the examiner's position that a range about 0.01 mL and about 10 mL per square centimeter of electrolysis unit cell area, and pressures of between about 5 psi (35 kPa) and about 1500 psi (10,500 kPa), and the fractional relative humidity to at least about 70%, would have been an obvious matter of design choice well within the level of ordinary skill in the art, depending on variables such as mass flow rate of the exhaust gas, as well as the size of the exhaust system, and properties of materials for making the electrolysis unit cell. Moreover, there is

nothing in the record which establishes that the claimed parameters present a novel or unexpected result (See In re Kuhle, 562 F. 2d 553, 188 USPQ 7 (CCPA 1975)).

Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art. In re Dreyfus, 22 CCPA (Patents) 830, 73 F.2d 931, 24 USPQ 52; In re Waite et al., 35 CCPA (Patents) 1117, 168 F.2d 104, 77 USPQ 586. Such ranges are termed "critical" ranges, and the applicant has the burden of proving such criticality. In re Swenson et al., 30 CCPA (Patents) 809, 132 F.2d 1020, 56 USPQ 372; In re Scherl, 33 CCPA (Patents) 1193, 156 F.2d 72, 70 USPQ 204. However, even though applicant's modification results in great improvement and utility over the prior art, it may still not be patentable if the modification was within the capabilities of one skilled in the art. In re Sola, 22 CCPA (Patents) 1313, 77 F.2d 627, 25 USPQ 433; In re Normann et al., 32 CCPA (Patents) 1248, 150 F.2d 627, 66 USPQ 308; In re Irmscher, 32 CCPA (Patents) 1259, 150 F.2d 705, 66 USPQ 314. More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation. In re Swain et al., 33 CCPA (Patents) 1250, 156 F.2d 239, 70 USPQ 412; Minnesota Mining and Mfg. Co. v. Coe, 69 App. D.C. 217, 99 F.2d 986, 38 USPQ 213; Allen et al. v. Coe, 77 App. D.C. 324, 135 F.2d 11, 57 USPQ 136.

Prior Art

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of five patents:

Oshima et al. (Patent Number 5272871), Murphy et al. (Patent Number 6122909), Caren et al. (Patent Number 5863413), Zanini-Fisher et al. (Patent Number 6272849), and Krutzsch et al. (Patent Number 5921076) all discloses an exhaust gas purification for use with an internal combustion engine.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Binh Tran whose telephone number is (703) 305-0245. The examiner can normally be reached on Monday-Friday from 8:30 a.m. to 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas E. Denion, can be reach on (703) 308-2623. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0861.

BT
October 30, 2004

Binh Q. Tran
Patent Examiner
AU 3748